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EXECUTIVE SUMMARY

This report summarizes the views of eight foundries which were interviewed in a pilot study of the Mobile Foundry Laboratory Program (MFL). The objective of the study was to document the technological and economic benefits accruing to the eight foundries from the visit of the MFL and to identify any problems they had experienced. A second objective was to determine whether or not the methodology employed in the pilot study was capable of assessing the results of the visits and to estimate the cost of a study of the remaining 42 foundries scheduled for a visit by the MFL by March 31,1985.

The companies reported that the MFL provides a valuable flow of technology which contributes significantly to productivity gains and to increased profits. All companies but one found the visit of the MFL to be useful and most rated it as very useful. All companies visited had implemented some of the technical recommendations made by the MFL teams and planned to implement most of the others in the future. Four of the foundries employed professional and technical staff and four did not. The four without technical expertise reported actual savings to date of about $13 thousand and expected savings of $629 thousand over the next five years. The four foundries with technical expertise had implemented eight technical recommendations and planned to implement seven others, but for a variety of reasons the resulting savings were not credited to the MFL visit in this analysis.

The study approach was modified during the pilot study by using the MFL reports as well as an interview guide during the meetings with the firms. It was found that this produced more detailed information about the implementation and results of the technical recommendations.Cost estimates and recommendations for the timing of a complete study of the other 42 foundries are included in the report.

1. INTRODUCTION

The Mobile Foundry Laboratory (MFL), a component of CANMET'S recently introduced START program, was launched in January 1984. It's main objectives are, by taking the laboratory to the foundry, to show companies the equipment and technology which is available and demonstrate it's usefulness in their foundries, to assist foundries to increase productivity through improved production methods and to guide future research at CANMET. The mobile laboratory is scheduled to visit a total of 50 foundries by March 31,1985. The purpose of this pilot study was to provide an assessment of the technological and economic benefits accruing to the eight participating foundries and to make recommendations concerning the costs, methodology and timing for a complete study of all the foundries visited by the MFL.

2. METHODOLOGY

Eight companies, which had been visited by the MFL in the early months of 1984, were selected as the sample for the pilot study. Officials from The Foundry Section of the Physical Metallurgy Research Laboratory telephoned each company to seek their cooperation in the study. Following that, the Kanata Consulting Group called each foundry to schedule an interview and subsequently a copy of the interview guide was mailed in advance to the contact person so that he could reflect on the subjects to be discussed prior to the meeting.

3. RESULTS

The results will be shown under the following main headings:

THE CHARACTERISTICS OF THE COMPANIES

TECHNOLOGICAL BENEFITS

ACTION TAKEN BY THE COMPANIES ON RECOMMENDATIONS BY THE MFL TEAM

ECONOMIC PAYOFFS

IMPRESSIONS OF THE MOBILE LABORATORY PROGRAM

3.1 CHARACTERISTICS OF THE COMPANIES

All eight companies were located in Ontario, six were Canadian owned and two foreign owned. Three companies directly employed professional or technical staff and a fourth had access to technical expertise at it's head office. Four of the smaller firms had neither professional or technical staff nor did they have access to technical expertise. Table I below is a summary of the data on the size, ownership, revenues, volumes and number of professional staff for each category of firm.

TABLE I

CHARACTERISTICS OF THE COMPANIES

company #	number of employees (1)	professional and technical employees	employees in R&D & quality control	annual sales (millions)	volume in tons of casting (million)
1	350	15	2	18	2.1
2	200	12	1	17	3.2
3	32	0(2)	0(2)	3.5	NA
4	140	12	6	8	1.5
5	68	0	0	2.7	NA
6	43	0	0	4	.6
7	8	0	0	.65	NA
8	25	0	0	.8	NA

(1) In all cases the total shown is for the whole plant - in some cases this included non-foundry operations.
(2) This firm has access to it's parent company R&D group in the U.S.

3.2 TECHNOLOGICAL BENEFITS

A distinct difference was found between the responses of the four companies which had access to technical expertise and the other four which did not.

All companies were asked to report on the technological benefits arising from the MFL visit under the following four categories:

- Moulding methods and sand control
- Determination of metal preparation and quality control
- Defect analysis through micro-structural analysis
- Computer analysis in process control

Tables 2 - 5 following summarize the responses for each category for companies with and without access to technological expertise.

TABLE 2

MOULDING METHODS AND SAND CONTROL

reported results	firms without technical expertise	% of firms	firms with technical expertise	% of firms
new knowledge, concepts, ideas	4	*100	1	25
assistance in solving technical problems	4	*100	2	50
adoption of new or improved processes	4	100	1	25
no significant results				

* Some firms reported benefits in several categories

TABLE 3

METAL PREPARATION AND QUALITY CONTROL

reported results	firms without expertise	% of firms	firms with technical expertise	% of firms
new knowledge, concepts, ideas	2	50%		
assistance in solving technical problems	3	75%	2	50%
adoption of new or improved processes	4	100%		
no significant results			2	50%

TABLE 4

MICRO STRUCTURAL DEFECT ANALYSIS

reported results	firms without expertise	% of firms	firms with technical expertise	% of firms
new knowledge, concepts, ideas	1	25%		
assistance in solving technical problems	2	50%		
adoption of new or improved processes	1	25%	1	25%
no significant results	1	25%	3	75%

TABLE 5

COMPUTER ANALYSIS FOR PROCESS CONTROL

reported results	firms without technical expertise	% of firms	firms with technical expertise	% of firms
new knowledge, concepts, ideas	1	25	1	25
assistance in solving technical problems	1	25		
adoption of new or improved processes				
no significant results	3	75	3	75

The above tables indicate that the four firms lacking technical expertise reported significantly more technological benefits from the visits. The number of companies reporting benefits from the computer analysis was suprisingly low. This may have been partly due to problems with the computer system experienced early in the schedule, as a number of firms reported that the computer was not working during their visit by the MFL.

3.3 ACTION TAKEN ON THE RECOMMENDATIONS BY THE MFL TEAM

In addition to the four categories of benefits illustrated above, the detailed recommendations to participating companies in the MFL reports were reviewed during the interviews. These reports were generally organized into a section on Metal Processing and a second section on Sand.

COMPANIES WITHOUT ACCESS TO TECHNICAL EXPERTISE

Generally speaking most of the recommendations which did not require the investment of significant sums have already been implemented by these firms. As all of the companies interviewed were operating at considerably less than capacity they were usually

reluctant to implement recommendations which entailed significant capital expenditures. While they planned to implement nearly all of the suggestions, the more costly ones had been deferred. One foundry manager had implemented all of the minor suggestions but was still waiting for the written report summarizing the recommendations. He hoped to use the data in the report to persuade his President that additional expenditures on quality control would result in a bountiful payoff. Another foundry manager planned to hire a professional engineer to improve quality control and a full time laboratory technician to test sand. Only one firm disagreed with any of the recommendations made. All four firms described the value and usefulness of the MFL visit in glowing terms.

COMPANIES WITH ACCESS TO TECHNICAL EXPERTISE

The melting and casting practices of these firms were generally found to be satisfactory by the MFL team. Numerous problems were identified in their sand practices however, and many recommendations were made suggesting improvements in the composition of the sand, the testing procedure employed and the production equipment used. Table 6 below lists the number of recommendations made and the action taken by the firms.

TABLE 6

Recommendations	Accepted and implemented	Not accepted and not implemented	Accepted implementation planned
21	8	6	7

A number of reasons were given for not accepting some of the recommendations. These included a shortage of funds and, in two cases, technical differences of opinion. One company found that the low volume of orders for bronze castings made it uneconomical to make changes in the system and in another, a complete re-organization of the firms production system meant that a particular recommendation was now redundant.While it seems clear that the eight recommendations accepted and implemented and the seven accepted with implementation planned later, would substantially improve productivity and efficiency in these foundries, the foundry mamagers claimed that they had been aware of these problems and had the technical knowledge to overcome them but had not done so because of a shortage of funds.There seemed to be a reluctance to admit that assessments from outside experts could unearth problems and propose solutions which would improve productivity in their plants. In the opinion of the investigator, some of these claims do not ring true as it is not logical that companies

would operate inefficiently for years, through good times and bad, if they were aware of technical improvements that would significantly reduce costs.

3.4 ECONOMIC BENEFITS

Estimates of Savings	Actual ($000)	Next 5 Years ($000)
Companies without access to technical expertise	12.7	629
Companies with access to technical expertise	0	0

Some savings were expected from the seven recommendations companies expected to implement later and from the eight already implemented by companies with technical expertise (see Table 6 above) but the firms were unable to estimate their value. One company estimated that savings of $1 million over the next five years would result from the recommended changes but claimed that implementation of all of these improvements had already been planned, so they were not credited to the program in this report. Another firm was in the process of re-organizing it's entire production system and was incorporating most of the suggestions made by the MFL team, but the foundry manager was unable to separate the expected savings stemming from the MFL recommendations from the overall expected savings. It seems clear therefore, that the economic benefits credited to the eight firms interviewed are understated, probably by a substantial amount.

TABLE 7

ELAPSED TIME BETWEEN VISIT AND SAVINGS

Elapsed Time	Companies which have realized savings	Companies expecting subsequent savings
less than 1 Year	3	0
1 - 3 Years	0	3
more than 3 Years	0	0

Most firms had already implemented some of the recommendations but expected to implement more in the next year or two.

3.5 IMPRESSIONS OF THE MOBILE LABORATORY PROGRAM

RATINGS OF THE MFL PROGRAM

Rating	Firms lacking expertise	firms with expertise
Not useful	0	1
Somewhat useful	0	1
Useful	1	2
Very useful- should be continued	3	0

Once again the two groups held somewhat divergent opinions about the program. Firms lacking technical expertise praised the program and offered comments such as; "very valuable";"terrific ideas and program"; and "would like an annual visit to check progress". Most firms which possessed technical expertise thought the program was useful or somewhat useful but their lower level of enthusiasm was reflected in comments such as;"very useful for small companies, not for ours"; "good as a check on in-house work"; "EMR people are first class professionals"and "the visit was interesting fo~ the foreman".

When asked for ideas that might improve the program, the following suggestions were offered by the companies, some of which were directly related to the program, others which were more general in nature:

- The written reports are very valuable and should be sent to the firms more quickly (this was mentioned by four firms). One firm still had not received it's report when the interview took place.
- A government sponsored apprentice program is needed to train personnel for the foundry industry - similar to the program in place in the United Kingdom.
- The MFL should schedule repeat visits for further analysis after changes are made.
- The program should be broadened to include more elements affecting productivity in a plant, such as conveyor systems and air set sand equipment.
- Information should be gathered and disseminated to firms describing what is happening in the market place.
- Training courses should be developed on different aspects of foundry work and delivered on site. These should be two or three days in duration and should use the MFL equipment.

4. DISCUSSION

The sample in the study was quite small and only covered one province, so any conclusions concerning the operation of the MFL itself should be tempered by direct feedback from personnel working on the MFL and by the judgement of the mamagers of the program. The results do indicate however, that the MFL is a highly effective method of transferring technology and know-how to a segment of Canadian industry which, on the average, tends to be technically retarded. The evidence also indicates that small firms lacking technical expertise realize more technological and economic benefits from the program and, no doubt because of this, are much more enthusiastic about it. This suggests that, in the future, when companies are being selected for MFL visits, consideration might be given to assigning priority to firms without in-house technical expertise.

5. RECOMMENDATIONS FOR REVIEWING REMAINING COMPANIES

One of the purposes of the pilot study was to determine if the approach used could adequately assess the technological and economic benefits and document the improvements arising from the visits. The study approach, in fact, was modified during the pilot study by reviewing the MFL reports to the foundries, as well as the interview guide, at the meetings with the companies. It was found that this method produced comprehensive information about the implementation of the technical recommendations and was a better way to lead the thinking of the foundry managers to the economic savings stemming from the MFL visits.

A second question concerning a study of the other forty-two firms is the optimum timing for a review of the results accruing to these firms. It is recommended that at least a three month period be allowed after the company receives the MFL report before scheduling the interview. This would suggest that the interviews could be begin about August 15,1985 and be completed by the end of September. The report on the findings could be available by the end of October. The study would cost appromixately $20,000 in consulting fees (based on the rates charged by the Kanata Consulting Group) and appromixately $4,500 in travel and other expenses.